U.S. Department
of Transportation

Federal Aviation
Administration

Advisory Circular

Subject: AIRPORT DESIGN

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1. PURPOSE. Advisory Circular (AC) 150/5300-13, AIRPORT DESIGN has been revised to incorporate recent changes and corrections.

2. PRINCIPAL CHANGES. The following revisions are included in this change:

a. The definition of aircraft approach category, paragraph 2, has been changed to reflect changed aircraft certification procedures.

b. Paragraphs 6, 305, 602, and appendix 8 are changed to be consistent with FAA Order 5200-8, Runway Safety Area Program.

c. Appendix 2, Threshold Siting Requirements, paragraph 5 has been revised to clarify nighttime requirements.

d. Appendix 16, New Instrument Approach Procedures has been changed to (1) allow ODALS, MALS, SSALS for runways with visibility minimums of less than 1 statute mile and (2) raise visibility minimums for approach category D aircraft.

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DAVID L. BENNETT
Director, Office of Airport Safety and Standards

Chapter 1. REGULATORY REQUIREMENTS AND DEFINITION OF TERMS

1. GENERAL. Section 103 of the Federal Aviation Act of 1958 states in part, "In the exercise and performance of his power and duties under this Act, the Secretary of Transportation shall consider the following, among other things, as being in the public interest: (a) The regulation of air commerce in such manner as to best promote its development and safety and fulfill the requirements of defense; (b) The promotion, encouragement, and development of civil aeronautics . . . ."

This public charge, in effect, requires the development and maintenance of a national system of safe, delay-free, and cost-effective airports. The use of the standards and recommendations contained in this publication in the design of airports supports this public charge. These standards and recommendations, however, do not limit or regulate the operations of aircraft.

2. DEFINITIONS. As used in this publication, the following terms mean:

Aircraft Approach Category. A grouping of aircraft based on 1.3 times their stall speed in the landing configuration at the certificated maximum flap setting and maximum landing weight at standard atmospheric conditions. On newer aircraft certifications, Vref is used to determine the Aircraft Approach Category. The categories are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more but less than 121 knots.

Category C: Speed 121 knots or more but less than 141 knots.

Category D: Speed 141 knots or more but less than 166 knots.

Category E: Speed 166 knots or more.

Airplane Design Group (ADG). A grouping of airplanes based on wingspan. The groups are as follows:

Group I: Up to but not including 49 feet (15 m).

Group II: 49 feet (15 m) up to but not including 79 feet (24 m).

Group III: 79 feet (24 m) up to but not including 118 feet (36 m).

Group IV: 118 feet (36 m) up to but not including 171 feet (52 m).

Group V: 171 feet (52 m) up to but not including 214 feet (65 m).

Group VI: 214 feet (65 m) up to but not including 262 feet (80 m).

Airport Elevation. The highest point on an airport's usable runway expressed in feet above mean sea level (MSL).

Airport Layout Plan (ALP). The plan of an airport showing the layout of existing and proposed airport facilities.

Airport Reference Point (ARP). The latitude and longitude of the approximate center of the airport.

Blast Fence. A barrier used to divert or dissipate jet blast or propeller wash.

Building Restriction Line (BRL). A line which identifies suitable building area locations on airports.

Clear Zone. See Runway Protection Zone.

Clearway (CWY). A defined rectangular area beyond the end of a runway cleared or suitable for use in lieu of runway to satisfy takeoff distance requirements.

Compass Calibration Pad. An airport facility used for calibrating an aircraft compass.

Declared Distances. The distances the airport owner declares available for the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

Takeoff run available (TORA) - the runway length declared available and suitable for the ground run of an airplane taking off;

Takeoff distance available (TODA) - the TORA plus the length of any remaining runway or clearway (CWY) beyond the far end of the TORA;

Accelerate-stop distance available (ASDA) -the runway plus stopway (SWY) length declared available and suitable for the acceleration and deceleration of an airplane aborting a takeoff; and

Landing distance available (LDA) - the runway length declared available and suitable for a landing airplane.

NOTE: The full length of TODA may not be usable for all takeoffs because of obstacles in the departure area. The usable TODA length is aircraft performance dependent and, as such, must be determined by the aircraft operator before each takeoff and requires knowledge of the location of each controlling obstacle in the departure area.

Frangible NAVAID. A navigational aid (NAVAID) which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft. The term NAVAID includes electrical and visual air navigational aids, lights, signs, and associated supporting equipment.

Hazard to Air Navigation. An object which, as a result of an aeronautical study, the FAA determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

Large Airplane. An airplane of more than 12,500 pounds (5 700 kg) maximum certificated takeoff weight.

Low Impact Resistant Supports (LIRS). Supports designed to resist operational and environmental static loads and fail when subjected to a shock load such as that from a colliding aircraft.

Object. Includes, but is not limited to above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft.

Object Free Area (OFA). An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle Free Zone (OFZ). The OFZ is the airspace below 150 feet (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches. The OFZ is sub-divided as follows:

Runway OFZ. The airspace above a surface centered on the runway centerline.

Inner-approach OFZ. The airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.

Inner-transitional OFZ. The airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to runways with approach visibility minimums lower than 3/4-statute mile (1 200 m).

Obstruction to Air Navigation. An object of greater height than any of the heights or surfaces presented in Subpart C of Code of Federal Regulation (14 CFR), Part 77. (Obstructions to air navigation are presumed to be hazards to air navigation until an FAA study has determined otherwise.)

Precision Approach Category I (CAT I) Runway. A runway with an instrument approach procedure which provides for approaches to a decision height (DH) of not less than 200 feet (60 m) and visibility of not less than 1/2 mile (800 m) or Runway Visual Range (RVR) 2400 (RVR 1800 with operative touchdown zone and runway centerline lights).

Precision Approach Category II (CAT II) Runway. A runway with an instrument approach procedure which provides for approaches to a minima less than CAT I to as low as a decision height (DH) of not less than 100 feet (30 m) and RVR of not less than RVR 1200.

Precision Approach Category III (CAT III) Runway. A runway with an instrument approach procedure which provides for approaches to minima less than CAT II.

Runway (RW). A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.

Runway Blast Pad. A surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

Runway Protection Zone (RPZ). An area off the runway end to enhance the protection of people and property on the ground.

Taxiway and taxilane standards are related to airplane design group.

b. Airport Design. Airport design first requires selecting the ARC(s), then the lowest designated or planned approach visibility minimums for each runway, and then applying the airport design criteria associated with the airport reference code and the designated or planned approach visibility minimums.

(1) An upgrade in the first component of the ARC may result in an increase in airport design standards. Table 1-1 depicts these increases.

(2) An upgrade in the second component of the ARC generally will result in a major increase in airport design standards.

(3) An airport upgrade to provide for lower approach visibility minimums may result in an increase in airport design standards. Table 1-2 depicts these increases.

(4) Operational minimums are based on current criteria, runways, airspace, and instrumentation. Unless this is taken into consideration in the development of the airport, the operational minimums may be other than proposed.

(5) For airports with two or more runways, it may be desirable to design all airport elements to meet the requirements of the most demanding ARC. However, it may be more practical to design some airport elements, e.g., a secondary runway and its associated taxiway, to standards associated with a lesser demanding ARC.

5. AIRPORT LAYOUT PLAN. An Airport Layout Plan (ALP) is a scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport. Any airport will benefit from a carefully developed plan that reflects current FAA design standards and planning criteria. (See appendices 6 and 7 for detailed information.)

a. FAA-Approved ALP. All airport development carried out at Federally obligated airports must be done in accordance with an FAA-approved ALP. The FAA-approved ALP, to the extent practicable, should conform to the FAA airport design standards existing at the time of its approval. Due to unique site, environmental, or other constraints, the FAA may approve an ALP not fully complying with design standards. Such approval requires an FAA study and finding that the proposed modification is safe for the specific site and conditions. When the FAA upgrades a standard, airport owners should, to the extent practicable, include the upgrade in the ALP before starting future development.

b. Guidance. AC 150/5070-6, Airport Master Plans, contains background information on the development of ALPs, as well as a detailed listing of the various components that constitute a well-appointed ALP.

c. Electronic Plans. The FAA recommends the development of electronic ALPs where practical.

6. MODIFICATION OF AIRPORT DESIGN STANDARDS TO MEET LOCAL CONDITIONS. "Modification to standards" means any change to FAA design standards, other than dimensional standards for runway safety areas. Unique local conditions may require modification to airport design standards on a case-by-case basis. A modification to an airport design standard related to new construction, reconstruction, expansion, or upgrade on an airport which received Federal aid requires FAA approval. The request for modification should show that the modification will provide an acceptable level of safety, economy, durability, and workmanship. Appendixes 8 and 9 discuss the relationship between airplane physical characteristics and the design of airport elements. This rationale along with the computer program cited in appendix 11 may be used to show that the modification will provide an acceptable level of safety for the specified conditions, including the type of aircraft.

7. NOTICE TO THE FAA OF AIRPORT DEVELOPMENT. 14 CFR Part 157, Notice of Construction, Activation, and Deactivation of Airports, requires persons proposing to construct, activate, or deactivate an airport to give notice of their intent to the FAA. The notice applies to proposed alterations to the takeoff and landing areas, traffic patterns, and airport use, e.g., a change from private-use to public-use.

a. Notice Procedure. 14 CFR Part 157 requires airport proponents to notify the appropriate FAA Airports Regional or District Office at least 30 days before construction, alteration, deactivation, or the date of the proposed change in use. In an emergency involving essential public service, health, or safety, or when delay would result in a hardship, a proponent may notify the FAA by telephone and submit Form 7480-1, Notice of Landing Area Proposal, within 5 days.

b. The Notice. The notice consists of a completed FAA Form 7480-1, a layout sketch, and a location map. The layout sketch should show the airport takeoff and landing area configuration in relation to buildings, trees, fences, power lines, and other similar significant features. The preferred type of location map is the 7.5 minute U.S. Geological Survey Quadrangle Map showing the location of the airport site. Form 7480-1 lists FAA Airports Office addresses.

c. FAA Action. The FAA evaluates the airport proposal for its impact upon the: safe and efficient use of navigable airspace; operation of air navigation facilities; existing or potential airport capacity; and safety of persons and property on the ground. The FAA notifies proponents of the results of the FAA evaluation.

d. Penalty for Failure to Provide Notice. Persons who fail to give notice are subject to civil penalty.

8. NOTICE TO THE FAA OF PROPOSED CONSTRUCTION. 14 CFR Part 77, Objects Affecting Navigable Airspace, requires persons proposing any construction or alteration described in 14 CFR Section 77.13(a) to give 30-day notice to the FAA of their intent. This includes any construction or alteration of structures more than 200 feet (61 m) in height above the ground level or at a height that penetrates defined imaginary surfaces located in the vicinity of a public-use airport.

a. Airport Data Requirements. Future airport development plans and feasibility studies on file with the FAA may influence the determinations resulting from 14 CFR Part 77 studies. To assure full consideration of future airport development in 14 CFR Part 77 studies, airport owners must have their plans on file with the FAA. The necessary plan data includes, as a minimum, planned runway end coordinates, elevation, and type of approach for any new runway or runway extension.

b. Penalty for Failure to Provide Notice. Persons who knowingly and willingly fail to give such notice are subject to criminal prosecution.

9. FAA STUDIES. The FAA studies existing and proposed objects and activities, on and in the vicinity of public-use airports. These objects and activities are not limited to obstructions to air navigation, as defined in 14 CFR Part 77. These studies focus on the efficient use of the airport and the safety of persons and property on the ground. As the result of these studies, the FAA may resist, oppose, or recommend against the presence of objects or activities in the vicinity of a public-use airport that conflict with an airport planning or design standard/recommendation. This policy is stated as a notice on page 32152 of Volume 54, No. 149, of the Federal Register, dated Friday, August 4, 1989. FAA studies conclude:

a. Whether an obstruction to air navigation is a hazard to air navigation;

b. Whether an object or activity on or in the vicinity of an airport is objectionable;

c. Whether the need to alter, remove, mark, or light an object exists;

d. Whether to approve an Airport Layout Plan;

e. Whether proposed construction, enlargement, or modification to an airport would have an adverse effect on the safe and efficient use of navigable airspace; or

f. Whether a change in an operational procedure is feasible.

10. FEDERAL ASSISTANCE. The FAA administers a grant program (per Order 5100.38, Airport Improvement Program (AIP) Handbook) which provides financial assistance for developing public-use airports. Persons interested in this program can obtain information from FAA Airports Regional or District Offices. Technical assistance in airport development is also available from these offices.

11. ENVIRONMENTAL ASSESSMENTS. Federal grant assistance in, or ALP approval of, new airport construction or major expansion normally require an environmental assessment in accordance with FAA Order 5050.4A, Airport Environmental Handbook, and the National Environmental Policy Act of 1969.

12. STATE ROLE. Many State aeronautics commissions or similar departments require prior approval and, in some instances, a license for the establishment and operation of an airport. Some States administer a financial assistance program similar to the Federal program and technical advice. Proponents should contact their respective State aeronautics commissions or departments for information on licensing and assistance programs.

13. LOCAL ROLE. Most communities have zoning ordinances, building codes, and fire regulations which may affect airport development. Some have or are in the process of developing codes or ordinances regulating environmental issues such as noise and air quality. Others may have specific procedures for establishing an airport.

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Chapter 3. RUNWAY DESIGN

300. **INTRODUCTION**. This chapter presents standards for runways and runway associated elements such as shoulders, blast pads, runway safety areas, obstacle free zones (OFZ), object free areas (OFA), clearways, and stopways. Tables 3-1, 3-2, and 3-3 present the standard widths and lengths for runway and runway associated elements. Also included are design standards and recommendations for rescue and firefighting access roads. At new airports, the RSA and ROFA lengths and the RPZ location standards are tied to runway ends. At existing constrained airports, these criteria may, on a case-by-case basis, be applied with respect to declared distances ends. See appendix 14.

301. **RUNWAY LENGTH**. AC 150/5325-4 and airplane flight manuals provide guidance on runway lengths for airport design, including declared distance lengths. The computer program cited in appendix 11 may be used to determine the recommended runway length for airport design.

302. **RUNWAY WIDTH**. Tables 3-1, 3-2, and 3-3 present runway width standards which consider operations conducted during reduced visibility.

303. **RUNWAY SHOULDERS**. Runway shoulders provide resistance to blast erosion and accommodate the passage of maintenance and emergency equipment and the occasional passage of an airplane veering from the runway. Tables 3-1, 3-2, and 3-3 present runway shoulder width standards. A natural surface, e.g., turf, normally reduces the possibility of soil erosion and engine ingestion of foreign objects. Soil with turf not suitable for this purpose requires a stabilized or low cost paved surface. Refer to chapter 8 for further discussion. Figure 3-1 depicts runway shoulders.

304. **RUNWAY BLAST PAD**. Runway blast pads provide blast erosion protection beyond runway ends. Tables 3-1, 3-2, and 3-3 contain the standard length and width for blast pads for takeoff operations requiring blast erosion control. Refer to chapter 8 for further discussion. Figure 3-1 depicts runway blast pads.

305. **RUNWAY SAFETY AREA (RSA)**. The runway safety area is centered on the runway centerline. Tables 3-1, 3-2, and 3-3 present runway safety area dimensional standards. Figure 3-1 depicts the runway safety area. Appendix 8 discusses the runway safety area's evolution.

a. Design Standards. The runway safety area shall be:

(1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;

(2) drained by grading or storm sewers to prevent water accumulation;

(3) capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and

(4) free of objects, except for objects that need to be located in the runway safety area because of their function. Objects higher than 3 inches (7.6 cm) above grade should be constructed on low impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no higher than 3 inches (7.6 cm) above grade. Other objects, such as manholes, should be constructed at grade. In no case should their height exceed 3 inches (7.6 cm) above grade.

b. Construction Standards. Compaction of runway safety areas shall be to FAA specification P-152 found in AC 150/5370-10.

c. Sub-standard RSAs. RSA standards are not like other airport design standards because they cannot be modified or waived. The dimensional standards remain in effect regardless of the presence of natural or man-made objects or surface conditions that might create a hazard to aircraft that leave the runway surface. A continuous evaluation of all practicable alternatives for improving each sub-standard RSA is required until they meet all standards for design and construction. Each FAA regional Airports division manager keeps a written determination of the best practicable alternative for improving each RSA. Therefore, RSA improvement projects must comply with the determination of the FAA regional Airports division manager.

d. Allowance for Navigational Aids. The RSA is intended to enhance the margin of safety for landing or departing aircraft. Accordingly, the design of an RSA must account for navigational aids that might degrade RSA effectiveness:

(1) An RSA graded to the *maximum* slope (see paragraph 502b) will require some approach lights to be mounted on massive towers that could create a hazard for aircraft. Therefore, consider any practicable RSA

construction *above* the maximum grades that might avoid the need for massive structures.

(2) Instrument landing system (ILS) facilities (glide slopes and localizers) are not usually required to be located inside the RSA. However, they *do* require a graded area around the antenna. See chapter 6 for more information on the siting of ILS facilities. RSA construction that ends abruptly in a precipitous drop-off can result in design proposals where the facility is located *inside* the RSA. Therefore, consider any practicable RSA construction beyond the standard dimensions that could accommodate ILS facilities if and when they are installed.

306. OBSTACLE FREE ZONE (OFZ). The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function. The runway OFZ and, when applicable, the inner-approach OFZ, and the inner-transitional OFZ comprise the obstacle free zone (OFZ). Figures 3-2, 3-3, 3-4, and 3-5 show the OFZ.

a. Runway OFZ. The runway OFZ is a defined volume of airspace centered above the runway centerline. The runway OFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The runway OFZ extends 200 feet (60 m) beyond each end of the runway. Its width is as follows:

(1) For runways serving small airplanes exclusively:

(a) 300 feet (90 m) for runways with lower than 3/4-statute mile (1 200 m) approach visibility minimums.

(b) 250 feet (75 m) for other runways serving small airplanes with approach speeds of 50 knots or more.

(c) 120 feet (36 m) for other runways serving small airplanes with approach speeds of less than 50 knots.

(2) For runways serving large airplanes, 400 feet (120 m).

b. Inner-approach OFZ. The inner-approach OFZ is a defined volume of airspace centered on the approach area. It applies only to runways with an approach lighting system. The inner-approach OFZ begins 200 feet (60 m) from the runway threshold at the same elevation as the runway threshold and extends 200 feet (60 m) beyond the last light unit in the approach lighting system. Its width is the same as the runway OFZ and rises at a slope of 50 (horizontal) to 1 (vertical) from its beginning.

c. Inner-transitional OFZ. The inner-transitional OFZ is a defined volume of airspace along the sides of the runway OFZ and inner-approach OFZ. It applies only to runways with lower than 3/4-statute mile (1 200 m) approach visibility minimums.

(1) For runways serving small airplanes exclusively, the inner-transitional OFZ slopes 3 (horizontal) to 1 (vertical) out from the edges of the runway OFZ and inner-approach OFZ to a height of 150 feet (45 m) above the established airport elevation.

(2) For runways serving large airplanes, separate inner-transitional OFZ criteria apply for Category (CAT) I and CAT II/III runways.

(a) For CAT I runways, the inner-transitional OFZ begins at the edges of the runway OFZ and inner-approach OFZ, then rises vertically for a height "H", and then slopes 6 (horizontal) to 1 (vertical) out to a height of 150 feet (45 m) above the established airport elevation.

1) In U.S. customary units, $H_{feet} = 61 - 0.094(S_{feet}) - 0.003(E_{feet})$.

2) In SI units, $H_{meters} = 18.4 - 0.094(S_{meters}) - 0.003(E_{meters})$.

3) S is equal to the most demanding wingspan of the airplanes using the runway and E is equal to the runway threshold elevation above sea level.

(b) For CAT II/III runways, the inner-transitional OFZ begins at the edges of the runway OFZ and inner-approach OFZ, then rises vertically for a height "H", then slopes 5 (horizontal) to 1 (vertical) out to a distance "Y" from runway centerline, and then slopes 6 (horizontal) to 1 (vertical) out to a height of 150 feet (45 m) above the established airport elevation.

1) In U.S. customary units, $H_{feet} = 53 - 0.13(S_{feet}) - 0.0022(E_{feet})$ and distance $Y_{feet} = 440 + 1.08(S_{feet}) - 0.024(E_{feet})$.

2) In SI units, $H_{meters} = 16 - 0.13(S_{meters}) - 0.0022(E_{meters})$ and distance $Y_{meters} = 132 + 1.08(S_{meters}) - 0.024(E_{meters})$.

3) S is equal to the most demanding wingspan of the airplanes using the runway and E is equal

to the runway threshold elevation above sea level. Beyond the distance "Y" from runway centerline the inner-transitional CAT II/III OFZ surface is identical to that for the CAT I OFZ.

307. RUNWAY OBJECT FREE AREA. The runway object free area (OFA) is centered on the runway centerline. The runway OFA clearing standard requires clearing the OFA of above ground objects protruding above the runway safety area edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the OFA. This includes parked airplanes and agricultural operations. Tables 3-1, 3-2, and 3-3 specify the standard dimensions of the runway OFA. Extension of the OFA beyond the standard length to the maximum extent feasible is encouraged. See figure 2-3.

308. CLEARWAY STANDARDS. The clearway (See figure 3-6) is a clearly defined area connected to and extending beyond the runway end available for completion of the takeoff operation of turbine-powered airplanes. A clearway increases the allowable airplane operating takeoff weight without increasing runway length.

a. Dimensions. The clearway must be at least 500 feet (150 m) wide centered on the runway centerline. The practical limit for clearway length is 1,000 feet (300 m).

b. Clearway Plane Slope. The clearway plane slopes upward with a slope not greater than 1.25 percent.

c. Clearing. Except for threshold lights no higher than 26 inches (66 cm) and located off the runway sides, no object or terrain may protrude through the clearway plane. The area over which the clearway lies need not be suitable for stopping aircraft in the event of an aborted takeoff.

d. Control. An airport owner interested in providing a clearway should be aware of the requirement that the clearway be under its control, although not necessarily by direct ownership. The purpose of such control is to ensure that no fixed or movable object penetrates the clearway plane during a takeoff operation.

e. Notification. When a clearway is provided, the clearway length and the declared distances, as specified in appendix 14, paragraph 7, shall be provided in the Airport/Facility Directory (and in the Aeronautical Information Publication (AIP), for international airports) for each operational direction.

309. STOPWAY STANDARDS. A stopway is an area beyond the takeoff runway, centered on the extended runway centerline, and designated by the airport owner for use in decelerating an airplane during an aborted takeoff. It must be at least as wide as the runway and able to support an airplane during an aborted takeoff without causing structural damage to the airplane. Their limited use and high construction cost, when compared to a full-strength runway that is usable in both directions, makes their construction less cost effective. See figure 3-7. When a stopway is provided, the stopway length and the declared distances, as specified in appendix 14, paragraph 7, shall be provided in the Airport/Facility Directory (and in the Aeronautical Information Publication (AIP), for international airports) for each operational direction.

310. RESCUE AND FIREFIGHTING ACCESS. Rescue and firefighting access roads are normally needed to provide unimpeded two-way access for rescue and firefighting equipment to potential accident areas. Connecting these access roads, to the extent practical, with the operational surfaces and other roads will facilitate aircraft rescue and firefighting operations.

a. Recommendation. It is recommended that the entire runway safety area (RSA) and runway protection zone (RPZ) be accessible to rescue and firefighting vehicles so that no part of the RSA or RPZ is more than 330 feet (100 m) from either an all weather road or a paved operational surface. Where an airport is adjacent to a body of water, it is recommended that boat launch ramps with appropriate access roads be provided.

b. All Weather Capability. Rescue and firefighting access roads are all weather roads designed to support rescue and firefighting equipment traveling at normal response speeds. Establish the widths of the access roads on a case-by-case basis considering the type(s) of rescue and firefighting equipment available and planned at the airport. The first 300 feet (90 m) adjacent to a paved operational surface should be paved. Where an access road crosses a safety area, the safety area standards for smoothness and grading control. For other design and construction features, use local highway specifications.

c. Road Usage. Rescue and firefighting access roads are special purpose roads which supplement but do not duplicate or replace sections of a multi-purpose road system. Restricting their use to rescue and firefighting access equipment precludes their being a hazard to air navigation.

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Table 3-1. Runway design standards for aircraft approach category A & B visual runways and runways with not lower than 3/4-statute mile (1 200 m) approach visibility minimums

(Refer also to Appendix 16 for the establishment of new approaches)

ITEM	DIM[1]	AIRPLANE DESIGN GROUP				
		I [2]	I	II	III	IV
Runway Length	A	- Refer to paragraph 301 -				
Runway Width	B	60 ft 18 m	60 ft 18 m	75 ft 23 m	100 ft 30 m	150 ft 45 m
Runway Shoulder Width		10 ft 3 m	10 ft 3 m	10 ft 3 m	20 ft 6 m	25 ft 7.5 m
Runway Blast Pad Width		80 ft 24 m	80 ft 24 m	95 ft 29 m	140 ft 42 m	200 ft 60 m
Runway Blast Pad length		60 ft 18 m	100 ft 30 m	150 ft 45 m	200 ft 60 m	200 ft 60 m
Runway Safety Area Width	C	120 ft 36 m	120 ft 36 m	150 ft 45 m	300 ft 180 m	500 ft 150 m
Runway Safety Area Length Beyond RW End[3]	P	240 ft 72 m	240 ft 72 m	300 ft 90 m	600 ft 180 m	1,000 ft 300 m
Obstacle Free Zone Width and length	- Refer to paragraph 306 -					
Runway Object Free Area Width	Q	250 ft 75 m	400 ft 120 m	500 ft 150 m	800 ft 240 m	800 ft 240
Runway Object Free Area Length Beyond RW End[3]	R	240 ft 72 m	240 ft 72 m	300 ft 90 m	600 ft 180 m	1,000 ft 300 m

1/ Letters correspond to the dimensions on figures 2-1 and 2-3.

2/ These dimensional standards pertain to facilities for small airplanes exclusively.

3/ The runway safety area and runway object free area lengths begin at each runway end when stopway is not provided. When stopway is provided, these lengths begin at the stopway end.

(2) AZ antennas require the area between the antenna and the stop end of the runway be cleared of objects that could reflect or block the signal. Figure 6-3 illustrates this area.

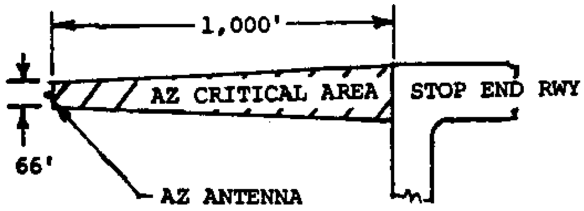


Figure 6-3. AZ antenna critical area

c. Elevation Antenna. Descent guidance is provided by the elevation (EL) antenna. The signal area extends from the horizon to 30 degrees above the horizon. The EL antenna height depends upon the beam width but would not exceed 18.6 feet (5.7 m).

(1) The EL antenna site is at least 400 feet (120 m) from the runway centerline and 800 to 1,000 feet (240 to 300 m) from the runway threshold and should provide a threshold crossing height of 50 feet (15 m). Figure 6-4 illustrates EL antenna siting.

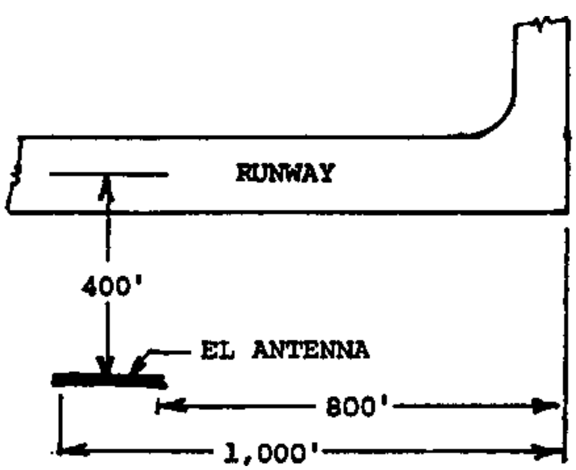


Figure 6-4. EL antenna siting

(2) EL antenna critical areas begin at the runway near edge and extend to 33 feet (10 m) outboard of the antenna site. They are 1,000 feet (300 m) in length, measured from the antenna toward the approaching aircraft. These areas should be clear of objects that could reflect or block the signal. Figure 6-5 illustrates this area.

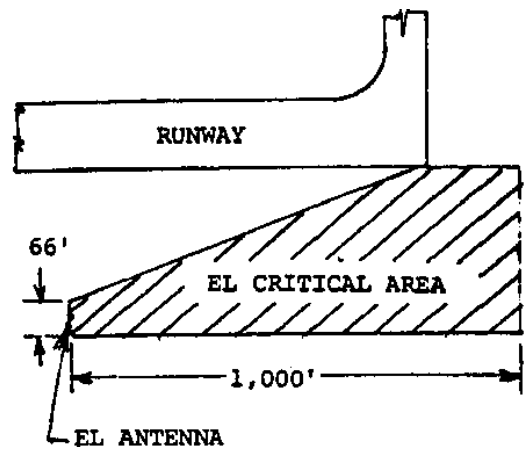


Figure 6-5. EL antenna critical area

d. Distance Measuring Equipment. Range information is provided by distance measuring equipment (DME). DME antennas are 22 feet (6.7 m) in height and normally are collocated with the AZ antenna. To preclude penetration of an approach surface, the collocated AZ/DME antennas should be placed 1,300 feet (390 m) from the runway end.

602. INSTRUMENT LANDING SYSTEM. The instrument landing system (ILS) provides pilots with electronic guidance for aircraft alignment, descent gradient, and position until visual contact confirms the runway alignment and location. Figure 6-2 illustrated ILS component locations.

a. General. The ILS uses a line-of-sight signal from the localizer antenna and marker beacons and a reflected signal from the ground plane in front of the glide slope antenna.

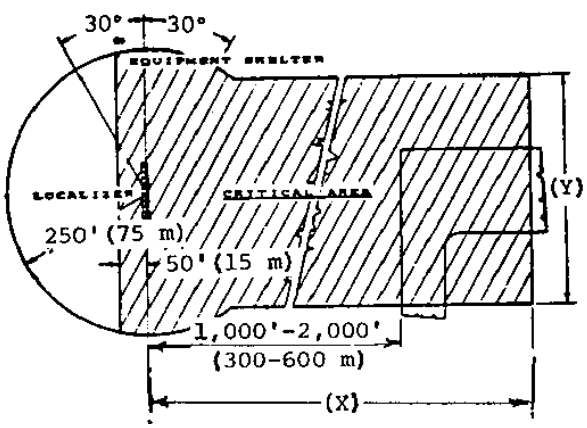
(1) ILS antenna systems are susceptible to signal interference sources such as power lines, fences, metal buildings, etc.

(2) Since ILS uses the ground in front of the glide slope antenna to develop the signal, this area should be graded to remove surface irregularities.

(3) ILS equipment shelters are located near but are not a physical part of the antenna installation.

b. Localizer Antenna. The localizer (LOC) signal is used to establish and maintain the aircraft's horizontal position until visual contact confirms the runway alignment and location.

(1) The LOC antenna is usually sited on the extended runway centerline outside the runway safety area between 1,000 to 2,000 feet (300 to 600 m) beyond the stop end of the runway. Where it is not practicable to locate the antenna beyond the end of the RSA, consider offsetting the localizer to the side to keep it clear of the RSA and to minimize the potential hazard to aircraft (See paragraph 305). The localizer critical area is illustrated in Figure 6-6.



NOTE: The X and Y dimensions vary depending on the system used.

X varies from 2,000 feet (600 m) to 7,000 feet (2100 m).

Y varies from 400 feet (120 m) to 600 feet (180 m).

Figure 6-6. ILS LOC siting and critical area

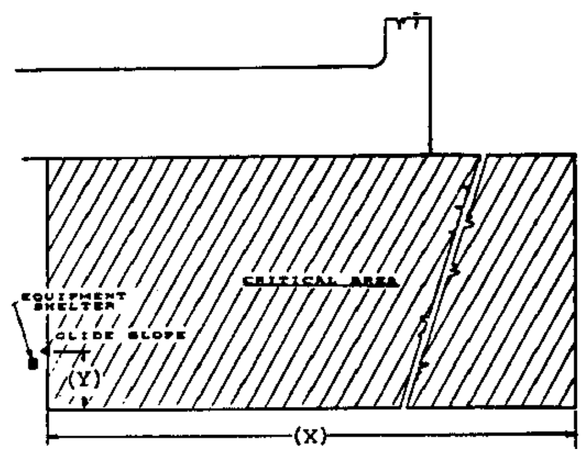
(2) The critical area depicted in figure 6-6 surrounding the LOC antenna and extending toward and overlying the stop end of the runway should be clear of objects.

(3) The critical area should be smoothly graded. A constant +1 percent to -1.5 percent longitudinal grade is recommended. Transverse grades should range from +1.0 percent to -3.0 percent, with smooth transitions between grade changes. Antenna supports shall be frangible and foundations should be flush with the ground.

(4) The LOC equipment shelter is placed at least 250 feet (75 m) to either side of the antenna array and within 30 degrees of the extended longitudinal axis of the antenna array.

c. Glide Slope Antenna. The glide slope (GS) signal is used to establish and maintain the aircraft's descent rate until visual contact confirms the runway alignment and location. A GS differentiates precision from nonprecision approaches.

(1) The GS antenna may be located on either side of the runway. The most reliable operation is obtained when the GS is located on the side of the runway offering the least possibility of signal reflections from buildings, power lines, vehicles, aircraft, etc. The glide slope critical area is illustrated in Figure 6-7.



NOTE: The X and Y dimensions vary depending on the system used.

X varies from 800 feet (240 m) to 3,200 feet (960 m).

Y varies from 100 feet (30 m) to 200 feet (60 m).

Figure 6-7. GS siting and critical area

(2) Signal quality is dependent upon the type of antenna used and the extent of reasonably level ground immediately in front of the antenna.

(3) The GS equipment shelter is located 10 feet (3 m) behind the antenna and a minimum of 400 feet (120 m) from the runway centerline.

Appendix 2. THRESHOLD SITING REQUIREMENTS

1. PURPOSE. This appendix contains guidance on locating thresholds to meet approach obstacle clearance requirements.

2. APPLICATION.

a. The threshold should be located at the beginning of the full-strength runway pavement or runway surface. However, displacement of the threshold may be required when an object that obstructs the airspace required for landing airplanes is beyond the airport owner's power to remove, relocate, or lower. Thresholds may also be displaced for environmental considerations, such as noise abatement, or to provide the standard RSA and ROFA lengths.

b. When a hazard to air navigation exists, the amount of displacement of the threshold should be based on the operational requirements of the most demanding airplanes. The standards in this appendix minimize the loss of operational use of the established runway. These standards reflect FAA policy of maximum utilization and retention of existing paved areas on airports.

c. Displacement of a threshold reduces the length of runway available for landings. Depending on the reason for displacement of the threshold, the portion of the runway behind a displaced threshold may be available for takeoffs in either direction and landings from the opposite direction. Refer to appendix 14 for additional information.

3. LIMITATIONS.

a. These standards should not be interpreted as an FAA blanket endorsement of the alternative to displace or relocate a runway threshold. Threshold displacement or relocation should be undertaken only after a full evaluation reveals that displacement or relocation is the only practical alternative.

b. The standards in this appendix are not applicable for identifying objects affecting navigable airspace (14 CFR Part 77) or zoning to limit the height of objects around airports (AC 150/5190-4).

4. EVALUATION CONSIDERATIONS.

a. When a penetration to a surface defined in paragraph 5 (threshold siting surfaces) exists, one or more of the following actions is required:

(1) The object is removed or lowered to preclude penetration of applicable threshold siting surfaces;

(2) The threshold is displaced to preclude object penetration of applicable threshold siting surfaces, with a resulting shorter landing distance; or

(3) Visibility minimums are raised.

(4) Prohibit night operations.

b. Relevant factors for evaluation include:

(1) Types of airplanes which will use the runway and their performance characteristics.

(2) Operational disadvantages associated with accepting higher landing minimums.

(3) Cost of removing, relocating, or lowering the object.

(4) Effect of the reduced available landing length when the runway is wet or icy.

(5) Cost of extending the runway if insufficient runway length would remain as a result of displacing the threshold. The environmental and public acceptance aspects of a runway extension need also be evaluated under this consideration.

(6) Cost and feasibility of relocating visual and electronic approach aids, such as threshold lights, visual approach slope indicator, runway end identification lights, localizer, glide slope (to provide a threshold crossing height of not more then 60 feet (18 m)), approach lighting system, and runway markings.

(7) Effect of the threshold change on noise abatement.

5. LOCATING, DISPLACING, OR RELOCATING THE THRESHOLD. The standard shape, dimensions, and slope of the surface used for locating a threshold is dependent upon the type of aircraft operations currently conducted or forecasted, the landing visibility minimums desired, and the types of instrumentation available or planned for that runway end.

Subparagraphs e, f, and g describe the minimum area required for instrument approach procedures aligned with the runway centerline. For nonprecision approach procedures not aligned with the runway centerline, the area is expanded on the side on which the procedure course lies. This expansion may splay up to 35° from runway. Both the length of these areas and the expansion for offset alignment are determined through instrument approach procedure development.

a. For Approach End of Runways Expected to Serve Small Airplanes with Approach Speeds Less Than 50 Knots (Visual Runways only, day/night).

(1) No object should penetrate a surface that starts at the threshold and at the elevation of the runway centerline at the threshold and slopes upward from the threshold at a slope 15 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 3,000 feet (900 m) along the extended runway centerline. This surface extends laterally 60 feet (18 m) on each side of the centerline at the threshold and increases in width to 150 feet (45 m) at a point 500 feet (150 m) from the threshold; thereafter, it extends laterally 150 feet (45 m) on each side of the centerline. (See figures A2-1 and A2-2.)

b. For Approach End of Runways Expected to Serve Small Airplanes with Approach Speeds of 50 Knots or More (Visual Runways only, day/night).

(1) No object should penetrate a surface that starts at the threshold and at the elevation of the runway centerline at the threshold and slopes upward from the threshold at a slope 20 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 5,000 feet (1 530 m) along the extended runway centerline. This surface extends laterally 125 feet (38 m) on each side of the centerline at the threshold and increases in width to 350 feet (110 m) at a point 2,250 feet (690 m) from the threshold; thereafter, it extends laterally 350 feet (110 m) on each side of the centerline. (See figures A2-1 and A2-2.)

c. For Approach End of Runways Expected to Serve Large Airplanes(visual day/night); or Instrument Minimums ≥ 1 Statute Mile. (Day Only).

(1) No object should penetrate a surface that starts at the threshold and at the elevation of the runway centerline at the threshold and slope upward from the threshold at a slope 20 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 10,000 feet (3 000 m) along the extended runway centerline. This surface extends laterally 200 feet (60 m) on each side of the centerline at the threshold and increases in width to 500 feet (150 m) at a point 1,500 feet (450 m) from the threshold; thereafter, it extends laterally 500 feet (150 m) on each side of the centerline. (See figures A2-1 and A2-2.)

d. For Approach End of Runways Expected to Support Instrument Night Circling.

(1) No object should penetrate a surface that starts 200 feet (60 m) out from the threshold and at the elevation of the runway centerline at the threshold and slopes upward from the starting point at a slope of 20 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 10,000 feet (3 000 m) along the extended runway centerline. This surface extends laterally 200 feet (60 m) on each side of the centerline at the starting point and increases in width to 1,700 feet (520 m) at the far end of this surface. (See figures A2-1 and A2-2.)

(3) To obtain night minimum, penetrations to this surface can be lighted to avoid displacing the threshold.

e. For Approach End of Runways Expected to Support Instrument Straight-In Night Operations.

(1) No object should penetrate a surface that starts 200 feet (60 m) out from the threshold and at the elevation of the runway centerline at the threshold and slopes upward from the starting point at a slope of 20 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 10,000 feet (3 000 m) along the extended runway centerline. This surface extends laterally 400 feet (120 m) on each side of the centerline at the starting point and increases in width to 1900 feet (570m) at the far end of this surface. (See figures A2-1 and A2-2.)

(3) If the instrument approach procedure utilizes an offset localizer with an offset angle of 3 degrees or less, the above surface is centered upon the final approach course rather than the extended runway centerline. (See figure A2-3.)

(4) To obtain night minimum, penetrations to this surface can be lighted to avoid displacing the threshold.

f. For Approach End of Runways Expected to Accommodate Instrument Approaches Having Visibility Minimums ¾ Mile but Less Than 1 Mile (Day or Night).

(1) No object should penetrate a surface that starts 200 feet (60 m) out from the threshold and at the elevation of the runway centerline at the threshold and slopes upward from the starting point at a slope of 20 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 10,000 feet (3 000 m) along the extended runway centerline. This surface extends laterally 400 feet (120 m) on each side of the centerline at the starting point and increases in width to 1900 feet (570m) at the far end of this surface. (See figures A2-1 and A2-2.)

(3) If the instrument approach procedure utilizes an offset localizer with an offset angle of 3 degrees or less, the above surface is centered upon the final approach course rather than the extended runway centerline. (See figure A2-3.)

g. For Approach End of Runways Expected to Accommodate Instrument Approaches Having Visibility Minimums Less Than ¾ Mile, or a Precision Approach (Day or Night).

(1) No object should penetrate a surface that starts 200 feet (60 m) out from the threshold and at the elevation of the runway centerline at the threshold and slopes upward from the starting point at a slope of 34 (horizontal) to 1 (vertical).

(2) In the plan view, the centerline of this surface extends 10,000 feet (3 000 m) along the extended runway centerline. This surface extends laterally 400 feet (120 m) on each side of the centerline at the starting point and increases in width to 1900 feet (570m) at the far end of this surface. (See figures A2-1 and A2-2.)

(3) If the instrument approach procedure utilizes an offset localizer with an offset angle of 3 degrees or less, the above surface is centered upon the final approach course rather than the extended runway centerline. (See figure A2-3.)

h. For Approach End of Runways Expected to Accommodate Category II Approach Minimums. Criteria are set forth in TERPS Order 8260.3B.

CAT.	Runway Type	DIMENSIONAL STANDARDS* Feet (Meters)					Slope
		A	B	C	D	E	
a.	Approach end of runways expected to serve small airplanes with approach speeds less than50 knots. (Visual runways only, day/night)	0	60 (18)	150 (45)	500 (150)	2,500 (750)	15:1
b.	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more. (Visual runways only, day/night)	0	125 (38)	350 (110	2,250 (690)	2,750 (840)	20:1
c.	Approach end of runways expected to serve large airplanes(Visual day/night); or instrument minimums ≥ 1 statute mile, day only.	0	200 (60)	500 (150)	1,500 (450)	8,500 (2,550)	20:1
d.[1]	Approach end of runways expected to support instrument night circling.	200 (60)	200 (60)	1700 (520)	10,000 (3,000)	0	20:1
e.[1]	Approach end of runways expected to support instrument straight in night operations	200 (60)	400 (120)	1900 (550)	10,000[2] (3,000)	0	20:1
f.	Approach end of having visibility minimums ≥3/4 but < 1 statute mile, day or night.	200 (60)	400 (120)	1900 (570)	10,000[2] (3,000)	0	20:1
g.	Approach end of runways having visibility minimums <3/4 statute mile or a precision approach, day or night.	200 (60)	400 (120)	1900 (570)	10,000[2] (3,000)	0	34:1
h.	Approach runway ends having Category II approach minimums or greater.	The criteria are set forth in TERPS order 8260.3B					

- The letters are keyed to those shown on figures A2-2 and A2-3.

Notes:
1. Lighting of obstacle penetrations to this surface may avoid displacing the threshold.
2. 10,000 feet is a nominal value for planning purposes. The actual length of these areas is dependent upon the visual descent point position of the instrument approach procedure.

Figure A2-1. Dimensional standards for locating thresholds

Appendix 8. RUNWAY DESIGN RATIONALE

1. SEPARATIONS. Dimensions shown in tables 2-1, 2-2, 3-1, 3-2, and 3-3 may vary slightly due to rounding off.

a. Runway to holdline separation is derived from landing and takeoff flight path profiles and the physical characteristics of airplanes. The runway to holdline standard satisfies the requirement that no part of an airplane (nose, wingtip, tail, etc.) holding at a holdline penetrates the obstacle free zone (OFZ). Additionally, the holdline standard keeps the nose of the airplane outside the runway safety area (RSA) when holding prior to entering the runway. When the airplane exiting the runway is beyond the standard holdline, the tail of the airplane is also clear of the RSA. Additional holdlines may be required to prevent airplane, from interfering with the ILS localizer and glide slope operations.

b. Runway to parallel taxiway/taxilane separation is determined by the landing and takeoff flight path profiles and physical characteristics of airplanes. The runway to parallel taxiway/taxilane standard precludes any part of an airplane (tail, wingtip, nose, etc.) on a parallel taxiway/taxilane centerline from being within the runway safety area or penetrating the OFZ.

c. Runway to airplane parking areas is determined by the landing and takeoff flight path profiles and physical characteristics of airplanes. The runway to parking area standard precludes any part of a parked airplane (tail, wingtip, nose, etc.) from being within the runway object free area or penetrating the OFZ.

2. OBSTACLE FREE ZONE (OFZ). The portion of the OFZ within 200 feet (60 m) of the runway centerline is required for departure clearance. The additional OFZ, beyond 200 feet (60 m) from runway centerline, is required to provide an acceptable accumulative target level of safety without having to adjust minimums. The level of safety for precision instrument operations is determined by the collision risk model. The collision risk model is a computer program developed from observed approaches and missed approaches. It provides the probability of an airplane passing through any given area along the flight path of the airplane. To obtain an acceptable accumulative target level of safety with objects in the OFZ, operating minimums may have to be adjusted.

3. RUNWAY SAFETY AREA.

a. Historical Development. In the early years of aviation, all airplanes operated from relatively unimproved airfields. As aviation developed, the alignment of takeoff and landing paths centered on a well defined area known as a landing strip. Thereafter, the requirements of more advanced airplanes necessitated improving or paving the center portion of the landing strip. The term "landing strip" was retained to describe the graded area surrounding and upon which the runway or improved surface was constructed. The primary role of the landing strip changed to that of a safety area surrounding the runway. This area had to be capable, under normal (dry) conditions, of supporting airplanes without causing structural damage to the airplanes or injury to their occupants. Later, the designation of the area was changed to "runway safety area," to reflect its functional role. The runway safety area enhances the safety of airplanes which undershoot, overrun, or veer off the runway, and it provides greater accessibility for firefighting and rescue equipment during such incidents. Figure A8-1 depicts the approximate percentage of airplanes undershooting and overrunning the runway which stay within a specified distance from the runway end. The runway safety area is depicted in figure 3-1 and its dimensions are given in tables 3-1, 3-2, and 3-3.

b. Recent Changes. After an overrun accident in Little Rock, Arkansas in 1999, FAA recognized that incremental improvements inside standard RSA dimensions can enhance the margin of safety for aircraft. This was a significant change from the earlier concept where the RSA was deemed to end at the point it was no longer graded and constructed to standards. Previously, a modification to standards could be issued if the actual, graded and constructed RSA did not meet dimensional standards as long as an acceptable level of safety was provided. Today, modifications to standards no longer apply to runway safety areas. (See paragraph 6) Instead, FAA field offices are required to maintain a written determination of the best practicable alternative for improving non-standard RSAs. They must continually analyze the non-standard RSA with respect to operational, environmental, and technological changes and revise the determination as appropriate. Incremental improvements are included in the determination if they are practicable and they will enhance the margin of safety.

4. RUNWAY OBJECT FREE AREA (ROFA). The ROFA is a result of an agreement that a minimum 400-foot (120 m) separation from runway centerline is required for equipment shelters, other than localizer equipment shelters. The aircraft parking limit line no longer exists as a separate design standard. Instead, the separations required for parked aircraft and the building restriction line from the runway centerline are determined by object clearing criteria.

5. RUNWAY SHOULDERS AND BLAST PADS. Chapter 8 contains the design considerations for runway shoulders and blast pads.

6. CLEARWAY. The use of a clearway for takeoff computations requires compliance with the clearway definition of 14 CFR Part 1.

7. STOPWAY. The use of a stopway for takeoff computations requires compliance with the stopway definition of 14 CFR Part 1.

8. RUNWAY PROTECTION ZONE (RPZ). Approach protection zones were originally established to define land areas underneath aircraft approach paths in which control by the airport operator was highly desirable to prevent the creation of airport hazards. Subsequently, a 1952 report by the President's Airport Commission (chaired by James Doolittle), entitled "The Airport and Its Neighbors," recommended the establishment of clear areas beyond runway ends. Provision of these clear areas was not only to preclude obstructions potentially hazardous to aircraft, but also to control building construction as a protection from nuisance and hazard to people on the ground. The Department of Commerce concurred with the recommendation on the basis that this area was "primarily for the purpose of safety and convenience to people on the ground." The FAA adopted "Clear Zones" with dimensional standards to implement the Doolittle Commission's recommendation. Guidelines were developed recommending that clear zones be kept free of structures and any development which would create a place of public assembly.

In conjunction with the introduction of the RPZ as a replacement term for clear zone, the RPZ was divided into "object free" and "controlled activity" areas. The RPZ function is to enhance the protection of people and property on the ground. Where practical, airport owners should own the property under the runway approach and departure areas to at least the limits of the RPZ. It is desirable to clear the entire RPZ of all aboveground objects. Where this is impractical, airport owners, as a minimum, shall maintain the RPZ clear of all facilities supporting incompatible activities. Incompatible activities include, but are not limited to, those which lead to an assembly of people.

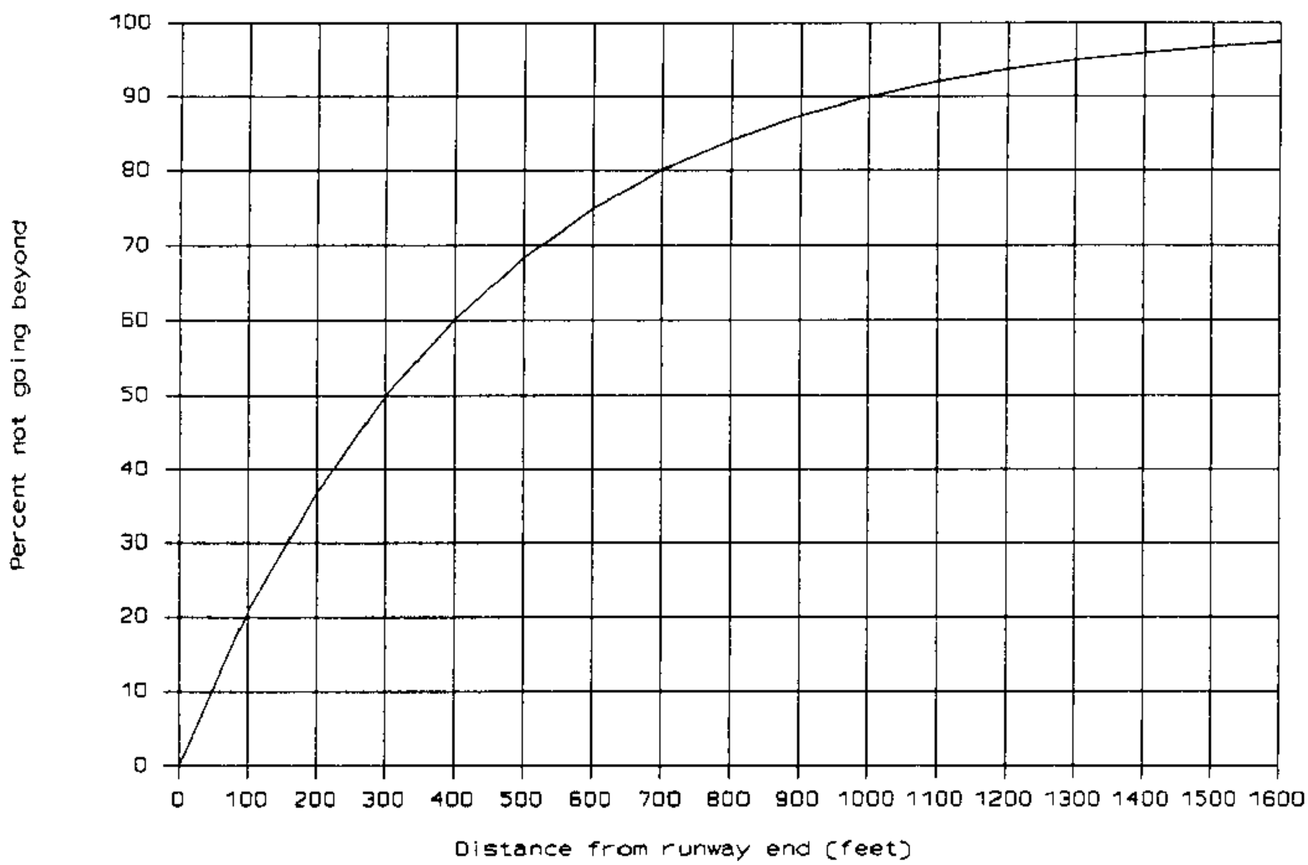


Figure A8-1. Approximate distance airplanes undershoot and overrun the runway end

Table A16-1B. Approach Procedure With Vertical Guidance (APV) Approach Requirements(LNAV/VNAV)

Visibility Minimums[1]	< 3/4-statute mile	< 1-statute mile	1-statute mile	>1-statute mile
Height Above Touchdown[2]	250	300	350	400
TERPS Glidepath Qualification Surface (GQS)[3]	Clear			
TERPS Paragraph 251	34:1 clear	20:1 clear	20:1 clear, or penetrations lighted for night minimums (See AC 70/7460-1)	
Precision Object Free Area (POFA) 200 x 800[4]	Required	Not Required		
Airport Layout Plan[5]	Required			
Minimum Runway Length	4,200 ft (1,280 m) (Paved)	3,200 ft (975 m)[6] (Paved)	3,200 ft(975 m)[6,7]	
Runway Markings (See AC 150/5340-1)	Precision	Nonprecision[7]		Visual (Basic)[7]
Holding Position Signs & Markings(See AC 150/5340-1 and AC 150/5340-18)	Precision	Nonprecision		
Runway Edge Lights[8]	HIRL / MIRL		MIRL/LIRL	
Parallel Taxiway [9]	Required		Recommended	
Approach Lights[10]	MALSR, SSALR, or ALSF	*Required*[11]	Recommended	
Runway Design Standards; e.g., Obstacle Free Zone (OFZ) [12]	<3/4-statute mile approach visibility minimums	≥ 3/4-statute mile approach visibility minimums		
Threshold Siting Criteria To Be Met [13]	Appendix 2, Paragraph 5g Criteria	Appendix 2, Paragraph 5f Criteria	Appendix 2, Paragraph 5 a,b,c,d,e Criteria	
Survey Required (see Table 16-2)	Line 7	Line 6	Line 6	Line 6

1. Minimums are subject to the application of FAA Order 8260.3 (TERPS) and associated orders. For CAT D Aircraft add ¼ mile.
2. The Height Above Touchdown (HAT) indicated is for planning purposes only. Actual obtainable HAT may vary.
3. The Glidepath Qualification Surface (GQS) is applicable to approach procedures providing vertical path guidance. It limits the magnitude of penetration of the obstruction clearance surfaces overlying the final approach course. The intent is to provide a descent path from DA to landing free of obstructions that could destabilize the established glidepath angle. The GQS is centered on a course from the DA point to the runway threshold. It's width is equal to the precision "W" surface at DA, and tapers uniformly to a width 100 feet from the runway edges. If the GQS is penetrated, vertical guidance instrument approach procedures (ILS/MLS/WAAS/LAAS/Baro-VNAV) are not authorized
4. This is a new airport surface (see paragraph 307).
5. An ALP is only required for obligated airports in the NPIAS; it is recommended for all others**.**
6. Runways less than 3,200' are protected by 14 CFR Part 77 to a lesser extent (77.23(a)(2) is not applicable for runways less than 3200 feet). However runways as short as 2400 feet could support an instrument approach provided the lowest HAT is based on clearing any 200-foot obstacle within the final approach segment.
7. Unpaved runways require case-by-case evaluation by regional Flight Standards personnel.
8. Runway edge lighting is required for night minimums. High intensity lights are required for RVR-based minimums.
9. A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ.
10. To achieve lower visibility minimums based on credit for lighting, a TERPS specified approach light system is required.
11. ODALS, MALS, SSALS are acceptable.
12. Indicates what chart should be followed in the related chapters in this document.
13. Circling procedures to a secondary runway from the primary approach will not be authorized when the secondary runway does not meet threshold siting (reference Appendix 2), OFZ (reference paragraph 306) and TERPS paragraph 251 criteria.

Table A16-1C. Nonprecision Approach Requirements

Visibility Minimums[1]	< 3/4-statute mile	< 1-statute mile	1-statute mile	>1-statute mile
Height Above Touchdown [2]	300	340	400	450
TERPS Paragraph 251	34:1 clear	20:1 clear	20:1 clear or penetrations lighted for night minimums (See AC 70/7460-1)	
Precision Object Free Area (POFA) 200 x 800[3]	Required	Not Required		
Airport Layout Plan[4]	Required			
Minimum Runway Length	4,200 ft (1,280 m) (Paved)	3,200 ft (975 m)[5] (Paved)	3,200 ft (975 m)[5,6]	
Runway Markings (See AC 150/5340-1)	Precision	Nonprecision[6]		Visual (Basic)[6]
Holding Position Signs & Markings (See AC 150/5340-1 and AC 150/5340-18)	Precision	Nonprecision		
Runway Edge Lights[7]	HIRL / MIRL		MIRL / LIRL	
Parallel Taxiway [8]	Required		Recommended	
Approach Lights[9]	MALSR, SSALR, or ALSF Required	Required [10]	Recommended	
Runway Design Standards, e.g. Obstacle Free Zone (OFZ)[11]	<3/4-statute mile approach visibility minimums	≥ 3/4-statute mile approach visibility minimums		
Threshold Siting Criteria To Be Met [12]	Appendix 2, Paragraph 5g Criteria	Appendix 2, Paragraph 5f Criteria	Appendix 2, Paragraph 5 a,b,c,d,e Criteria	
Survey Required (see Table 16-2)	Line 5	Line 4	Line 3	Line 3 Line 2

1. Minimums are subject to the application of FAA Order 8260.3 (TERPS) and associated orders. For CAT D aircraft add ¼ mile ; CAT D minimum visibility ¾ for localizer approach, 1 mile for other non-precision approaches.
2. The Height Above Touchdown (HAT) indicated is for planning purposes only. Actual obtainable HAT may vary.
3. This is a new airport surface (see paragraph 307).
4. An ALP is only required for obligated airports in the NPIAS; it is recommended for all others.
5. Runways less than 3,200’ are protected by 14 CFR Part 77 to a lesser extent. However runways as short as 2400 feet could support an instrument approach provided the lowest HAT is based on clearing any 200-foot obstacle within the final approach segment.
6. Unpaved runways require case-by-case evaluation by regional Flight Standards personnel.
7. Runway edge lighting is required for night minimums. High intensity lights are required for RVR-based minimums.
8. A parallel taxiway must lead to the threshold and, with airplanes on centerline, keep the airplanes outside the OFZ.
9. To achieve lower visibility minimums based on credit for lighting, a TERPS specified approach lighting system is required.
10. ODALS, MALS, SSALS, SALS are acceptable.
11. Indicates what chart should be followed in the related chapters in this document
12. Circling procedures to a secondary runway from the primary approach will not be authorized when the secondary runway does not meet threshold siting (reference Appendix 2), OFZ (reference paragraph 306), and TERPS paragraph 251 criteria.